

Appl. No. 09/884,215
Amdt. dated March 5, 2004
Reply to Office action of December 5, 2003

REMARKS/ARGUMENTS

Claims 1-22 are pending in this application. Claims 23-28 have been canceled herein, Claims 29-47 having been previously canceled. Applicant reserves the right to file a divisional application with respect to canceled Claims 23-47. Claims 1-22 have been rejected. Claim 48 has been added. Claims 1-3, 13, 14, 16-18 and 20-22 have been amended. In accordance with the new rules, all the claims are shown above, and the Currently Amended claims are shown in a redlined format. In view of the amendments, as discussed below, reconsideration of the Application and issuance of a Notice of Allowability are respectfully requested.

Restriction was required under 35 U.S.C. §121 between Claims 1-22, drawn to a method of forming media strands or nanofiber by electrospinning, and Claims 23-38 drawn to an apparatus for producing media strands or nanofibers. Applicant hereby elects Claims 1-22 to be prosecuted. Accordingly, Claims 23-38 have been canceled.

Initially, Applicant notes that many of the claims are amended herein to replace written out numbers with the numerical equivalent. Additionally, Claim 21 was amended to add a claim of dependency which was inadvertently omitted in the originally filed application. These amendments are not made for patentability purposes and do not affect the scope of the claim. Rather, the amendments are only made for purposes of readability.

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Initially, Applicant notes that no rejection was made against Claims 13 and 14. Claims 13 and 14 are thus believed to be allowable if placed in independent form. Applicant will amend Claim 13 to be in independent form upon an indication from the Examiner that Claims 13 and 14 are only objected to as depending from a rejected base claim.

Claims 1, 4-12 and 15-22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Dzenis et al. (6,265,333) in view of Kellenberger et al. (6,645,407), Hyon et al (4,663,358) and Gvozdic (6,608,117). Claims 2-3 (which depend from Claim 1) are rejected 35 U.S.C. § 103 as being unpatentable over Dzenis et al. (6,265,333) in view of Kellenberger et al. (6,645,407), Hyon et al (4,663,358) and Gvozdic (6,608,117), and further in view of Fujiwara et al. (6,472,470). Lastly, Claim 5 (which depends from Claim 1) is rejected as being unpatentable over Dzenis et al. (6,265,333) in view of Kellenberger et al. (6,645,407), Hyon et al (4,663,358), Gvozdic (6,608,117), Fujiwara et al. (6,472,470) and further in view of Vanderhoff et al. (6,241,331).

Dzenis et al. describes a method of manufacturing thin polymeric fibers by electrospinning polymer solutions in a high-voltage electric field. (Col. 8, lines 18-22). However, Dzenis et al. do not disclose that the voltage applied is dependent upon the relative portions of the polymer or the size of the media to be produced. Additionally, Dzenis et al. do not disclose the use of water-soluble fibers or the use of

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a cross-linking agent, as set forth in Claim 1.

Kellenberger et al. describes the use of crosslinkers to improve the water-absorbing performance of water-absorbing polymers. Additionally, Kellenberger discloses that the fibers include a superabsorbent polymer precursor composition which is added to cellulose fibers, staple fibers and/or thermoplastic fibers. (Col. 4, lines 58-60). Kellenberger does not disclose the compounding of "a water-soluble polymer *substantially only* with ... a selected cross-linking chemical agent with the remainder being water to form a combined compound". Further, Kellenberger does not disclose electrospinning.

Claims 1 and 22, as currently amended, are patentable over Dzenis et al. and Kellenberger. To establish obviousness the prior art references when combined must teach or suggest all of the claim limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). However, neither Dzenis et al. nor Kellenberger, alone or combined teach or suggest all of the limitations of amended Claims 1 and 22.

Claim 1 has been amended to provide that the water soluble polymer is compounded "substantially only" with the cross-linking chemical agent the remainder being water and to provide that the voltage selected is dependant "upon the portion of the combined components and the size of the media strands to be formed". Neither Dzenis et al. nor Kellenberger, alone or combined, teach or suggest a method which includes compounding "a water-soluble polymer substantially only with

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... a selected cross-linking chemical agent with the remainder being water to form a combined compound" and that this "combined compound" is electrospun at high-voltage wherein the voltage selected is based on the "portion of the combined components and the size of the media strands to be formed" as is now set forth in Claim 1.

With regard to Claim 22, it is even clearer that the cited art fails to render the claim obvious. Amended Claim 22 is directed to a method of forming a nanofiber filter media that comprises combining approximately 3% to 50% polyvinyl alcohol with 0.1% to 20% glyoxal, with the balance being water, passing the selected compound at a controlled pressure to a pumping zone into a feeding zone having a voltage in the range of 3kV to 100kV. The method of Amended Claim 22 produces nanofibers that are approximately 0.1mm to 3mm and at a volume of 0.008 to 20 cubic centimeters per minute. The cited references clearly do not teach methods that include these limitations (i.e., the nanofiber size, the rate of production, and the voltage range).

Therefore, it is submitted that since both Dzenis and Kellenberger et al., whether considered alone or in combination, fail to teach each and every element of Amended Claims 1 and 22, Amended Claims 1 and 22 are patentable over the references. Accordingly, Applicant respectfully requests that the rejection of Claims 1 and 22 under 35 U.S.C. §103(a) be withdrawn.

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As to Claims 8, 10 and 11-12 the Examiner notes that Hyon et al. teaches conventional crosslinking agents for hydrophobic polymers. As to claims 6, 9 and 11, the Examiner notes further that Gvozdic ('117) teaches crosslinking agents for crosslinking hydrophobic materials. The Examiner argues that it would have been obvious to one skilled in the art at the time the invention was made to use any of the hydrophilic polymer crosslinker agents as suggested in Gvozdic '117 and Hyon et al. for producing PVA or cellulose crosslinked fiber by an electrospinning process since fibers are formed by the process independent of its composition and the result is known to those skilled in the art.

While Applicant agrees that the references do teach conventional crosslinking agents for hydrophobic and hydrophilic polymers, the claims are nevertheless unobvious in the light of the references. First, there must be some suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine the reference teachings. *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In addition, the prior art must provide a reasonable expectation of success for the proposed modification. *In re Dow Chemical Co. v. American Cyanamid Co.*, 837 F.2d 469 (Fed. Cir. 1988). Here, there is no motivation to combine the reference teaching because there is absolutely no reason to expect that they would be successful in the methods claimed.

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The chemical arts are extremely unpredictable. The fact that a crosslinking agent has been used with certain polymers in the past has no bearing on whether those crosslinking agents may be combined with those polymers within in the specific methods of Claims 1 and 22. In this case, there is no reason to believe that using the claimed polymers with the claimed crosslinking agents at high voltages will produce nanofibers that are of sufficient strength and flexibility to permit media shaping. The prior art simply teaches that the crosslinking agents have been employed to enhance the mechanical strength of one particular polymer. The Examiner's obviousness conclusion is based on hindsight reasoning, which has been long held to be improper. *In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971). What the Examiner has presented is "obviousness to try," which is not the standard under 35 U.S.C. §103(a). *In re Dow Chemical Co. v. American Cyanamid Co.*, 837 F.2d 469 (Fed. Cir. 1988). "The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984).

In addition, Claims 4-12 and 15-21 depend from Claim 1, and therefore incorporate all of the limitations therein. Since it is submitted for the aforementioned reasons, i.e. each and every element of the claim is not suggested or taught by the cited art, that Claim 1 is patentable, it is likewise submitted that the claims that depend therefrom are also patentable, including Claims 8, 10 and 11-12. Therefore,

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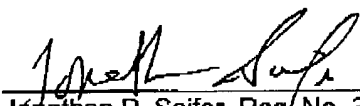
Applicant respectfully requests that the rejection of claims 4-12 and 15-21 under 35 U.S.C. §103(a) be withdrawn.

New Claim 48 has been added. New Claim 48 is similar to claim 1, but further provides that "said combined compound comprises approximately 3% to 50% by weight of the water-soluble polymer and said cross-linking chemical agent comprises approximately 0.1% to 20% of the total compound by weight of at least one of an acid or a dialdehyde, with the balance by weight being water" as is set forth in Claim 22. Claim 48 is believed to be allowable for the same reasons set forth above in conjunction with Claims 1 and 22.

In view of the foregoing, all of the pending claims are believed to be in condition for allowance. A Notice of Allowability with respect to these claims is thus respectfully requested.

Respectfully Submitted,

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Jonathan P. Soifer, Reg. No. 34,932
Polster, Lieder, Woodruff & Lucchesi, L.C.
12412 Powerscourt Drive, Suite 200
St. Louis, Missouri 63131
Tel: (314) 238-2400
Fax: (314) 238-2401
e-mail: JSoifer@patpro.com